Less Popular but More Effective Toeholds in Corporate Takeovers

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Abstract

Despite their claimed advantages, toehold strategies have rarely been adopted in recent corporate takeovers and do not seem to increase acquirer returns. Are toeholds ineffective and becoming obsolete? We show that this is not the case. We find that toeholds are preferred for executing difficult takeovers. After controlling for such endogeneity in toehold-based acquisitions, toeholds do increase returns to acquirers. Moreover, the performance of toehold strategies improves over time due to more selective and more effective acquisition of toeholds. We find that this time trend is in part explained by learning-by-doing from past toehold acquisitions.

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I. Introduction

The new highs reached with each merger wave[1] stand in contrast to the skepticism frequently expressed by shareholders of acquiring firms about individual transactions. This skepticism is often justified, as although mergers and acquisitions create value overall, the benefits flow mostly to the sellers. The announcement returns to the acquirers are, on average, close to zero.[2]

Acquiring with a toehold has been suggested as an effective strategy for improving the odds for acquirers, yet this strategy is infrequently executed (Betton, Eckbo, and Thorburn (2009)). The limited use of toeholds has been identified as an important research gap, referred to as the "toehold puzzle." This puzzle is particularly relevant in light of low acquirer returns in corporate takeovers. This paper shows that the infrequent use of toeholds presents a misleading picture of the effectiveness of this strategy. We demonstrate that toeholds are more likely to be used in takeover deals with strong target management resistance.[3] Controlling for selection bias, toeholds prove their value for acquirers in these difficult deals. This insight particularly holds in more recent years and for acquirers with toehold experience who have developed specific expertise to execute such deals more successfully.

An acquirer using a toehold aims to execute a two-step acquisition strategy, first building a minority stake that functions as a toehold and next, using advantages granted by the toehold to gain full control. This strategy provides a solution to several common takeover problems, such as the winner's curse, the free-rider problem, and intense competition, that cause low acquirer returns. A toehold provides an insider position in the target firm and therefore reduces valuation uncertainty (Bulow, Huang, and Klemperer

[1] According to Thomson Reuters, the worldwide mergers and acquisitions (M&A) value in 2015 exceeded $4.5 trillion, a new historical high compared to the record set in 2007 which had a total deal value of $4.3 trillion. The total value of deals in 2016 at $3.7 trillion remains the third largest on record.

[2] See Leeth and Borg (2000), Moeller, Schlingemann, and Stulz (2007) and Stulz, Walkling, and Song (1990).

[3] Takeovers with toeholds are more likely to be hostile, involve poison pills, are in the form of tender offers, are cash offers, and occur in multiple bidder contests. Detailed statistics can be found in Table 2.

(1999), Ouimet (2012)), which allows the acquirer to avoid low returns due to the winner's curse (Thaler (1988)). Moreover, small shareholders may free ride, causing a zero payoff to the acquirer, when they ask for an acquisition premium equal to the expected synergy value to tender their shares (e.g., Grossman and Hart (1980)). Building up a toehold can mitigate the free-rider problem because the acquirer can make a profit on the minority stake, even when they offer a control premium (Shleifer and Vishny (1986)). A toehold position may also help win a takeover contest. When the toehold is acquired at a relatively low price, overbidding for a controlling stake can even be profitable. Moreover, when a takeover contest is lost, a toehold owner can benefit by selling its toehold to the rival bidder at a high price (Burkart (1995), Singh (1998)). A common explanation for low acquirer returns in full acquisitions is intense competition among acquirers. Ex ante, a toehold can deter rival bidders (Betton and Eckbo (2000)); ex post, toehold-owners are more likely to win and pay a lower control premium when competitive bidding starts (Betton and Eckbo (2000), Hirshleifer and Titman (1990), Walkling (1985)).

These benefits probably increased the popularity of toehold acquisition strategies in the early 1980s, when over 60% of the tender offers were executed through toehold strategies. Since then, the proportion has decreased substantially to less than 10% in the past decade. Moreover, the average effect of toeholds on acquirer returns appears to be insignificant (Betton et al. (2009)).[4] This raises an important question: Does the apparent ineffectiveness of toeholds on acquirer returns indicate that the toehold strategy has become obsolete over time? The evidence presented in this paper shows that this is not the case. We argue and show that toeholds are most likely to feature in difficult takeovers, i.e., those that offer low expected acquirer returns in the first place. Furthermore, the performance of toeholds improves over time because acquirers learn to execute this strategy optimally. Toehold acquirers "learn by doing," but only if they have specific toehold acquisition experience. Compared to acquirers without toehold experience, past toehold-owners develop their acquisition capabilities about when and how large a toehold to buy.

[4] See Eckbo (2009) for an overview of the toehold literature.

To support our main argument that toehold-specific experience helps acquirers to develop capabilities to better execute toehold strategies in fewer deals but under more difficult conditions, we perform our analysis in several steps with increasing complexity. First, we run simple OLS regressions to identify the overall effect of toeholds on acquirer returns and then add a time interaction term to observe how the effect of toeholds evolves over time. Consistent with Betton et al. (2009), we find insignificant correlations between toeholds and acquirer returns in OLS regressions. However, contradicting the "obsolete toehold" argument, we find that toeholds are actually associated with more positive acquirer returns over time. Second, after controlling for endogeneity, we show that toehold positions increase acquirer returns in difficult circumstances. Using instrumental variable (IV) regressions, we find that instrumented toehold variables are positively related to acquirer returns. Meanwhile, the differences between OLS and IV estimates are negative, indicating that endogeneity causes a downward bias in the perceived acquisition performance using toeholds.

Next, we investigate in detail how acquirers improve their capabilities in executing toehold strategies. We find that acquirers increasingly incorporate an optimal toehold threshold when deciding on the size of a toehold, as proposed by Betton et al. (2009), causing toehold strategies to become more effective over time. We test whether acquisition experience helps acquirers to improve their toehold decisions. Interestingly, we find that general acquisition experience has only a limited effect on enhancing efficiency in toehold-based acquisition strategies, but it is toehold-specific experience that helps acquirers to improve their capabilities to execute toehold strategies. Past toehold owners make better decisions on whether to buy a toehold and are more responsive to the optimal threshold for the size of the toehold.

The different facets of our overall economic story of the evolution of toeholds have implications for several strands of the literature. First, our study complements the toehold literature with a dynamic analysis of endogeneity in bidding based on toehold positions. Previous studies show that the costs of acquiring a toehold depend on acquirer characteristics, such as synergistic gains (Chowdhry and Jegadeesh (1994)); target characteristics, such as when a toehold drives up the stock price of illiquid targets before a

takeover announcement (Bris (2002), Ravid and Spiegel (1999)); and most importantly, the level of managerial entrenchment (Betton et al. (2009), Goldman and Qian (2005)). Because acquirer, target, and deal characteristics vary, acquiring a toehold is an endogenous decision, where acquirers make a trade-off between the costs and benefits of bidding on a toehold position. To our knowledge, no empirical study on toeholds has tackled this endogeneity. We show that after correcting for endogeneity, toehold bidding appears to generate significantly higher returns to acquirers, compared to takeovers without toeholds.

Our explanation of how the execution of these strategies becomes more effective is most closely related to Betton et al. (2009). They show that an optimal threshold for toehold size is a key consideration, but our study adds new insights into the time trend and learning-by-doing in the execution of toehold strategies. Building on Betton et al. (2009) in estimating the effective toehold threshold, we show that the determination of toehold size becomes more responsive to thresholds over time, which leads to efficiency improvements in toehold acquisitions.

Our explanations and evidence of why toehold strategies are better executed contribute to the debate on whether there is a learning effect in repetitive acquisitions. While early studies argue that firms with previous acquisition experience would do better than those without such experience (Lubatkin (1983), Schipper and Thompson (1983)), empirical evidence is inconclusive. On one hand, some studies find a declining trend in serial acquirers' returns from deal to deal (Ahern (2008), Billett and Qian (2008), Fuller, Netter, and Stegemoller (2002), Ismail (2008), Guest, Cosh, Hughes, and Conn (2004)), putting the learning hypothesis in doubt. On the other hand, some studies argue that acquirers do learn in serial acquisitions by incorporating market signals from previous deals (Aktas, de Bodt, and Roll (2009), Aktas, de Bodt, and Roll (2011)). Moreover, the learning effect is more evident when the previous deal is successful (Ismail (2008)), when the target is distressed (Bruton, Oviatt, and White (1994)), or when successive deals are more similar (Aktas, de Bodt, and Roll (2013)).

Most of the existing research on the learning effect in serial acquisitions is based upon performance measures such as stock returns, acquisition premium, and time between deals. To our knowledge, we are

the first to show that acquirers with specific experience in toehold bidding become more responsive to the toehold threshold when selecting toehold size, resulting in a trend of less frequent but more effective use of toehold strategies over time. We find that general acquisition experience does not necessarily bring higher returns in subsequent bids, but that experience with similar deals (i.e., past ownership of toeholds) increases the performance of acquisitions based on toehold positions. We conclude that the capabilities gained with experience need to be quite specific to be effective. Our study reveals that acquirers learn to buy larger stakes to be effective in complex transactions or withhold from toehold strategies altogether.

II. Data Description

A. Sample Construction

In constructing our sample, we start with all of the mergers and acquisitions announced by U.S. public acquirers for U.S. public targets between 1990 and 2014, extracted from the Security Data Corporation (SDC) database.[5] We require that all included bids are aimed at obtaining control of a target, so acquirers are restricted to those who own less than 50% of the target's shares before the takeover and who intend to gain control (i.e., obtain more than 50%) after the transaction. We also require data on both the target and acquirer in each deal to be available from the Center for Research in Security Prices (CRSP), so that takeover performance is measurable. To ensure that the transactions have a substantial effect on acquirers' performance, targets are required to have a market valuation of no less than 5% of the acquirer's valuation 42 days before the announcement date. Special transactions marked as spinoffs, exchange offers, self-tenders, repurchases, recapitalizations, acquisitions of remaining interest, minority stake purchases, and privatizations are excluded as are all deals announced as rumors. Observing these

[5] We start our sample in 1990, as Betton et al. (2009) argue that the key trade-off in acquiring with toehold is the potential target resistance. In the mid-1980s, the widespread adoption of takeover defenses, such as "poison pill" tactics made targets better positioned to resist hostile takeovers. Toeholds are much more common in hostile takeovers than in friendly takeovers. As a result, takeovers with toeholds declined rapidly in late 1980s (Betton, Eckbo, and Thorburn (2008a)). Other studies such as Bebchuk and Cohen (2003) show that the average state antitakeover index of U.S. increased by four times in late 1980s (from 0.59 in 1986 to 2.45 in 1990) and remained at around 2.50 onwards. As we show that target resistance is indeed the key consideration in toehold purchase and acquirers gradually learn to acquire toehold effectively, we have excluded this structural change from our sample.

requirements results in a sample of 2,868 bids. Moreover, the toehold acquisition is an endogenous decision, and this paper uses ACQUIRER_EQUITY_INVESTMENT (Compustat item #31) to compute an instrumental variable to address this endogeneity. To make the sample consistent across sections, we drop observations without available instrument data. This leads to a final sample of 1,661 bids.[6]

[Insert Table 1 about here]

Table 1 presents the yearly distribution of deals in our sample. The surge in takeovers between the mid-1990s and early 2000s is consistent with the merger waves recorded in the takeover literature (e.g., Betton et al. (2008a)). The number of takeover deals declined in 2008 due to the financial crisis. The percentage of toeholds used in bids to gain control was low over the whole of our sample period, at an average of 4.09% of all takeovers. It was relatively high at the beginning (16.67% of all deals in 1990), then declined gradually for some time and fluctuated at a low level.

B. Measures for Takeover Efficiency

We take an acquirer's perspective and use acquirer returns to measure toehold performance.[7] Returns to acquirers are calculated by ACQUIRER_CARs (cumulative abnormal returns to acquirers) over the event window [-41, 1] and the total contest window [-41, end], where the end date is defined as the earlier of the target delisting date and the day of the last bid in the contest plus 126 trading days.[8] The total contest window can be further divided into the runup period [-41, -2], the announcement period [-1, 1], and the post-announcement period [2, end]. We estimate daily abnormal returns AR_{jk} for each event period using the method described by Betton et al. (2008a):

[6] To check the representativeness of the final sample, we base Table 1 to Table 4 on the larger sample of 2,868 bids, and compare the results with the final smaller sample. Bid characteristics are similar and comparable in the two samples. The tables based on the sample of 2,868 bids are not reported here but can be provided upon request.

[7] We also examined returns to targets and the price premium to study the gains to the target's shareholders but found no significant results. Moreover, since a toehold acquisition is mainly a strategic decision made by the acquirer, an acquirers' perspective seems more relevant to analyze the efficiency of toeholds. To enhance the focus of this paper, we do not report target returns.

[8] This is the same as defined in Betton et al. (2008a).

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=1}^{K} AR_{jk} d_{kt} + \varepsilon_{jt}, \quad t = day\{-293, \ldots, end\},$$

where r_{jt} is the excess return to firm j at day t, r_{mt} is the value-weighted market return adjusted by the risk-free rate, and d_{kt} is a dummy variable that takes a value of one if day t is in the kth event window, and zero otherwise. Stock returns are obtained from the CRSP database, and the market return and risk-free rates are obtained from Kenneth French's website. Each included firm requires at least 100 return observations over the whole event window. Our estimation method applies OLS with White's heteroskedastic-consistent covariance matrix. The CAR to firm j over event period k is $\mathrm{CAR_{jk}} = \omega_k \mathrm{AR_{jk}}$, where ω_k is the number of trading days in the event window. ACQUIRER_CAR[-41, 1] is thus the sum of CARs in the runup period and the announcement period, and ACQUIRER_CAR[-41, END] is the sum of the CARs in all three periods.

[Insert Table 2 about here]

Table 2 summarizes our estimated toehold efficiency measured by acquirer returns across the full sample and two subsamples (with and without toeholds). Over the whole sample, returns to acquirers are near zero in window [-41, 1] and negative in window [-41, end]. There is no significant difference in ACQUIRER_CARs for takeovers executed with toeholds compared to those without toeholds.

C. Sample Characteristics

Table 2 also presents an overview of the deal characteristics of our sample. To ensure comparability, we choose the same control variables as Betton et al. (2009) and add several variables for acquirer characteristics. The target characteristics are comparable between acquisitions with and without toeholds. The average target size for acquisitions with toeholds is about $1,398m (at 2014 values) compared to $1,466m for targets acquired without toeholds. The CARs to the targets over the runup period [-41, -2] are lower for acquisitions with toeholds (0.021) than for those without (0.054). In terms of liquidity, the targets of toehold strategies and non-toeholds are similar. Approximately 2.9% of the targets in takeovers with toeholds have stock prices lower than one dollar versus 2.1% without toehold bidding. The average

daily turnover of target shares is 0.5% in toehold strategies and is 0.6% for takeovers without toeholds. The proportion of targets listed on either the NYSE or the Amex is also comparable for deals with or without toeholds (39.7% vs. 33.2%).

With respect to acquirer characteristics, the average acquirer size is slightly higher for acquisitions with toeholds, about $7.27m vs. $6.28m for acquirers without toeholds. A small proportion of acquirers are classified as penny stocks; 0% for toehold acquirers and 0.3% for non-toehold acquirers. There are differences between toehold bidders and non-toehold bidders with respect to two measures of stock liquidity, ACQUIRER_TURNOVER and ACQUIRER_NYSE|AMEX. Although the differences are significant, the pattern is ambiguous because the two measures indicate opposite results. While the stock of toehold bidders has a lower turnover rate (implying lower liquidity) than that of non-toehold bidders, toehold bidders are more likely to be listed in major stock exchanges (implying higher liquidity). With respect to industry relatedness, about 44.1% of takeovers using toeholds are within-industry compared to 41.9% for takeovers without toeholds.

However, significant differences can be found in deal characteristics. Poison pills occur more frequently in toehold strategies (7.4%) than in non-toehold strategies (1.1%). About 36.8% of deals with toeholds are tender offers compared to only 12.6% of deals without toeholds. Toehold owners also use cash payments more frequently than non-toehold acquirers (33.8% vs. 20.7%). Deals with toeholds are frequently more hostile; 25% of takeovers using toeholds are hostile, whereas only 3.6% of takeovers without toeholds are hostile. Most of the takeovers in our sample are single-bidder deals. The average number of bidders is slightly higher in takeovers with toeholds compared to those without toeholds (1.191 vs. 1.104). All the differences in deal characteristics are significant based on both t-tests for mean comparison and Wilcoxon rank-sum tests for median comparison.

III. Improved Toehold Efficiency Despite Infrequent Adoption

In this section, we use OLS regressions to review the evolution of toehold performance from 1990 to 2014. We first consider the effect of bidding with toeholds on acquirer CARs. Panel A of Table 3 presents

the OLS regression results on acquirer returns, using two measures for the use of toehold strategies. The first is a toehold dummy, equal to one if the takeover is with a toehold and zero otherwise. The second is a continuous measure of toehold size, which is equal to the percentage of target shares owned by the acquirer before a takeover announcement. To deal with the potential concern that residuals may be correlated across firms, we cluster the standard error estimation at the acquirer level in all regressions (Petersen (2009)). Moreover, considering the time series distribution of the sample, we control for year dummies in all regressions.

[Insert Table 3 about here]

For each dependent variable, we present the regression in two specifications. The first specification includes TOEHOLD as an explanatory variable, and the second adds an interaction term TOEHOLD*TIME as well as a standalone TIME (where TIME measures the year difference between the observation year and the base year of 1990).[9] The estimates of TOEHOLD in the first specification indicate the aggregated effect of toeholds in the whole sample, and the estimate of TOEHOLD*TIME shows how the toehold effect evolves over time. Table 3 shows that without the interaction term, the coefficient of TOEHOLD is not significant, which is in line with the findings in Betton et al. (2009). On an aggregated level, toeholds do not have a significant effect on acquirer returns. However, with the addition of the interaction term TOEHOLD*TIME, toeholds seem to have a time-varying effect on ACQUIRER_CARs. In the second specification, the stand-alone variables for toeholds have negative coefficients, and the interaction with time has positive coefficients. In regressions with a toehold dummy, the stand-alone toehold has a coefficient of -0.119 for event window [-41, 1] in column 2 and -0.140 for the longer event window [-41, end] in column 4, but TOEHOLD*TIME has a positive coefficient of 0.009 for event window [-41,1] in column 2 and 0.012 for event window [-41, end] in column 4. The results indicate that toehold owners' return annually increases by approximately 7.6% (=0.009/0.119) for

[9] To alleviate the potential collinearity between the TIME variable and year dummies, we randomly drop a year dummy while performing the regressions.

ACQUIRER_CAR[-41, 1] and by 8.6% (=0.012/0.140) for ACQUIRER_CAR[-41, END]. Similar patterns are found in regressions with TOEHOLD_SIZE. The coefficients of TOEHOLD and TOEHOLD*TIME have opposite signs and are significant at the 5% level in regressions on ACQUIRER_CAR[-41, END] in column 8. In summary, the above findings suggest that toehold strategies have a negative effect on acquirer returns at the beginning of our sample. However, in more recent years, toeholds have generated higher acquirer returns.

With respect to the control variables, buying a larger target results in higher acquirer returns. The coefficient of TARGET_SIZE is significantly positive in four regressions out of eight specifications. Consistent with Betton, Eckbo, and Thurborn (2008b), we find that TARGET_RUNUP is positively correlated with ACQUIRER_CAR*s*. The liquidity measures of target shares, TARGET_PENNY_STOCK and TARGET_NYSE|AMEX, are associated with higher acquirer returns, whereas TARGET_TURNOVER has a negative effect. ACQUIRER_SIZE is negatively correlated with acquirer returns, which is consistent with Moeller, Schlingemann, and Stulz (2004). Deals done by acquirers who are listed on either the NYSE or Amex exchange have higher returns. Buying a target in a similar industry does not significantly affect returns to acquirers compared to cross-industry acquisitions. Whether or not the target uses a poison pill strategy does not significantly influence acquirer returns. Deals in the form of tender offers bring higher returns in the shorter window [-41, -1], but do not lead to a significant difference in the final return (for the total contest window [-41, end]). Deals with pure cash payment generate higher returns to acquirers, consistent with the signaling effect of pure cash payments. Hostile takeovers have lower acquirer returns in the event window [-41, 1], but the negative effect loses its significance in the longer window. ACQUIRER_CARs do not differ in terms of number of acquirers and deal completion. In general, most of control variables show similar effects as in Betton et al. (2009).

Note that our sample period covers the merger wave, which started in the mid-1990s and continued to the early 2000s, causing a concentration of observations in that period. A proportion of 53% of total deals and 63% of toehold strategies occurred during the merger wave period. To alleviate a potential concern

that the yearly improvement in toehold performance is mainly driven by the special condition of the merger wave, we drop all the takeover deals announced from 1994 to 2001 and repeat the regressions in Panel B of Table 3. The positive trend in the impact of toeholds on acquirer returns remains the same despite of a significant decline in the sample size.

IV. Endogeneity in the Regressions of Toehold Performance

In an effort to explain the toehold puzzle, extant studies have highlighted various costs of buying a toehold. However, only some of these costs, such as market liquidity and merger legislation (in Ravid and Spiegel (1999)) can be relatively easily measured and controlled for in regressions. Many determinants of toeholds are hard to observe or are often even unobservable. Such determinants include the bidder's private value (Bris (2002), Chowdhry and Jegadeesh (1994), Ravid and Spiegel (1999)) and target management entrenchment (Betton et al. (2009), Goldman and Qian (2005)). Such unobservables nevertheless have an effect on the acquirers' decision to buy a toehold and on their returns. It is, however, unclear how omitted variables will bias estimated toehold performance. For instance, an acquirer that can only create a low synergistic value from the target will presumably not send the right signal to the markets with a bid, and is, therefore, less likely to buy a toehold, compared to an acquirer who can create high synergistic value. In this situation, omitting the bidder's private target value can bias the effect of toehold acquisitions on returns upwards. In another situation, an acquirer may have to buy a large toehold to overcome target management resistance. Given management resistance, the bid might result in low acquirer returns. Thus, omitting management resistance can bias the returns in toehold biddings downwards.

We control for endogeneity of the occurrence of toehold acquisitions using an IV regression. We propose a candidate IV in the context of a toehold acquisition: ACQUIRER_EQUITY_INVESTMENT. To construct this instrumental variable, we first collect data on an acquirer's equity investment ("Investments and Advances – Equity," Compustat item #31) from the last annual report before the takeover announcement. Then we look into the 10-K filings in EDGAR database of U.S. Securities and

Exchange Commission (SEC) website to check whether this item includes a minority stake investment in the target. If so, we deduct the value of the minority stake investment in the target from "Investments and Advances – Equity." The ratio between the adjusted value and the acquirer's value of total assets is defined as ACQUIRER_EQUITY_INVESTMENT. The accounting item "Investments and Advances – Equity" records long-term investments in unconsolidated affiliates with significant control, i.e., investment in minority stakes of other firms. By definition, such minority ownership ranges from 20% to 50% and is made for long-term investment purposes. We suggest it as an instrument because most toeholds are acquired at least six months before takeover announcements and are large. As shown in Betton et al. (2009), about 91% of toehold bidders have long-term toeholds with an average size of 20% of the target's shares. This indicates that some toehold bidding occurs after a bidder had developed its minority holdings in a target firm from long-term equity investment. A bidder's long-term investment in other firms' equity represents a potential pool for these kinds of deals and so increases the probability of toehold bidding without directly affecting acquisition returns. We adjust "Investments and Advances – Equity" by deducting the minority stake investment in the target to exclude a mechanical relation between the instrument and the endogenous variable.

Table 4 reports outcomes from Instrumental Variable regressions, based on a linear two-stage least square (2SLS) estimation method. Note that our measure for a toehold is either a binary variable, TOEHOLD_DUMMY, or a censored continuous variable, TOEHOLD_SIZE (censored at zero). Given the binary or censored distribution of toehold variables, one might attempt to use a nonlinear first stage to generate fitted values that can be plugged directly into the second-stage equation. However, this does not generate consistent estimates unless the nonlinear model happens to be exactly right (Angrist and Krueger (2001)). As discussed in Angrist and Krueger (2001) and Kelejian (1971), in this case, a linear 2SLS (where both the first and second stages use linear regression specifications) can still be performed as the consistency of 2SLS does not rely on getting the first-stage functional form right.

[Insert Table 4 about here]

Part I of Panel A in Table 4 reports estimates in a 2SLS IV regression. After controlling for endogeneity in the toehold's effect on acquisition performance, the coefficient estimates of TOEHOLD all become positive in Table 4. Moreover, the coefficients in the longer window [-41, end] are positively significant at the 10% level. These results support our argument that toehold acquisitions are endogenously adopted. Moreover, the omitted characteristics are associated with a downward bias in estimated toehold performance, suggesting that toeholds are more likely to be employed in difficult takeovers. This is not surprising as Table 2 indicates that toehold deal characteristics involve more resistance such as poison pills, tender offers, pure cash payments, hostile attitudes, and multiple bidders. We conduct additional tests on toehold acquisitions and deal attitude in Section VI to further prove the endogeneity in the occurrence of toehold acquisitions and takeover resistance.

Part II of Panel A in Table 4 reports the first stage estimates of the IV regressions. In the first stage, we use the instrument and the control variables in Table 3 to fit the toehold variables. Column 5 to 8 report the coefficient estimates of the instrument. All the coefficients are significant at the 1% level, indicating a strong association between toehold ownership and the acquirer's previous equity investment.

In Panel B of Table 4, we report several IV tests. Part I of Panel B reports the correlation coefficient between the instrument, toehold size, and acquirer CARs. It aims to provide an informal check of the exclusion condition of the IV. The results show that the instrument, ACQUIRER_EQUITY_INVESTMENT, is uncorrelated with ACQUIRER_CARs (with *p*-values greater than 0.27), but is significantly correlated with TOEHOLD_SIZE (with a *p*-value below 0.001). This indicates to some extent that the IV is unlikely to affect acquirer returns in takeovers. To further verify the exclusion condition, we report several additional tests in Section VI.

Part II of Panel B in Table 4 reports the weak-instrument tests. For an instrument to be valid, it must be sufficiently correlated with the endogenous regressor TOEHOLD. If an instrument is only weakly correlated with the endogenous regressor, the IV estimators are biased toward the OLS estimator, and inference based on the standard errors reported can be severely misleading (Hahn and Hausman (2003),

Nelson and Startz (1990), Staiger and Stock (1997)). We use two tests in the first stage to test for a weak instrument. First, an F-value statistic tests whether the instrument has significant explanatory power for the TOEHOLD variable in addition to the original set of control variables. All F-statistics are significant at the 5% level. Second, we also report the minimum eigenvalue statistics as a weak instrument test (Cragg and Donald (1993)). All the statistics clearly exceed the critical value of the Wald test, thus again rejecting the null hypothesis of a weak instrument.

V. Learning to Acquire

As discussed in Section IV, omitted and unobservable drivers of toehold acquisitions can cause an over- or under-estimation of the efficiency of toehold strategies. By addressing the endogeneity problem, we find that endogeneity causes a downward bias in the OLS estimates of the relation between toeholds and acquirer returns. It suggests that the unobservable determinants of toehold acquisitions adversely affect toehold performance.

A. Toehold Size in Toehold Bidding

Target management resistance is a factor that determines the occurrence of toehold acquisitions and can adversely affect acquirer returns. Betton et al. (2009) develop a two-stage takeover model to quantify a trade-off between rejection costs and advantages in toehold bidding. To function as a toehold, the optimal equity stake is either zero (to avoid rejection costs) or exceeds a threshold (so that toehold benefits offset rejection costs). In this section, we show that the probability of toehold bidding and the size of the toehold respond to such a threshold. Moreover, the effect of the threshold on toehold size increases over time, consistent with our hypothesis that toehold acquisitions become more efficient.

We use the formula derived by Betton et al. (2009) to quantify the toehold threshold:

$$\hat{\alpha} = -k_1 + \sqrt{k_1^2 + k_2},$$

where $\hat{\alpha}$ denotes the toehold threshold, $k_1 = v - r - \frac{1}{2}(v^2 - t^2) - t/(1-\theta)$, $k_2 = r(2v - r) + [2(1-\theta) - t]$ and v stands for the acquirer's private value with assumed distribution $v \sim U[0,1]$ and can

be proxied by the initial offer premium. The termination fee t is the average fee for control bids in the same industry and year, reflecting in part the bidder's opportunity loss of a merger termination agreement. The probability θ of takeover failure is estimated from a Probit model regressed on the probability of deal completion (DEAL_COMPLETE) with a set of explanatory variables: TARGET_SIZE, TARGET_TURNOVER, TARGET_PENNY_STOCK, TARGET_NYSE|AMEX, POISON_PILL, HORIZONTAL, TENDER_OFFER, ALL_CASH, and year dummies.[10] The resistance cost r is given by $r = -(1-v) + \sqrt{(1-v)^2 + \frac{2t}{1-\theta} - t^2}$.[11]

Following Betton et al. (2009), we analyze how toehold thresholds determine the probability of toehold bidding and the toehold size. Table 5 presents the results for linear probability models (LPM) in regressions on the choice of buying a toehold or not, and OLS models in regressions on toehold size.[12] For each set of models, we use one specification with THRESHOLD (THRESHOLD WITH TOEHOLD) to check its overall effect, and another specification with both THRESHOLD (THRESHOLD_WITH_TOEHOLD) and interaction terms THRESHOLD*TIME (THRESHOLD_WITH_TOEHOLD*TIME), to observe the evolution in toehold acquisitions. Specifically, THRESHOLD stands for the toehold threshold, $\hat{\alpha}$, and THRESHOLD_WITH_TOEHOLD refers to the toehold threshold in takeovers with actual toehold purchase. The control variables are the same as those in Betton et al. (2009) with the addition of acquirer characteristics and the instrumental variable, ACQUIRER_EQUITY_INVESTMENT.

[Insert Table 5 about here]

[10] This corresponds to the estimation of Threshold I in Betton et al. (2009).

[11] We have 1,550 observations due to limited available data to estimate the threshold.

[12] As it is difficult to interpret marginal effects of interaction terms in non-linear models (Ai and Norton, 2003), we use the LPM and OLS regressions in this section as they provide consistent estimates of marginal effects. We obtain similar results when we use Probit and Tobit models, respectively. Moreover, this paper is closely related to Betton et al. (2009) which perform similar linear regressions. Using LPM and OLS models helps to make our results comparable to Betton et al. (2009). The non-linear regression results are provided in the online Appendix.

Betton et al. (2009) show that the threshold estimate is negatively correlated with the probability toehold bidding occurs and positively correlated with toehold size. Our estimates confirm their findings. The coefficient of THRESHOLD on its own is significantly negative in the LPM model (column 1 of Table 5). Given that a toehold is acquired, the size of the toehold is positively correlated with toehold threshold. The coefficient of THRESHOLD_WITH_TOEHOLD is significant at the 1% level in column 3 of Table 5.

The results of the model, presented in column 4 of Table 5, show that the positive relation between THRESHOLD_WITH_TOEHOLD and TOEHOLD_SIZE increases over time. The estimate of THRESHOLD_WITH_TOEHOLD *TIME is positive and significant at the 1% level. There is no such detectible trend in the probability of bidding using toeholds in the regression of column 2 of Table 5. Although it has a positive coefficient, the interaction term THRESHOLD*TIME is not significant at a 10% level. This implies that the improvement of toehold performance over time can be attributed to acquirers' choices of a more effective toehold size over time.

B. Can Acquisition Experience Improve the Efficiency of Toehold Acquisitions?

The previous findings indicate that toehold owners learn over time to buy larger toeholds when toehold thresholds increase. We explore whether learning-by-doing (i.e., gaining acquisition experience) can improve acquirer efficiency in toehold acquisitions.

We use two measures of acquisition experience, SERIAL_ACQUIRER and PAST_TOEHOLD_OWNER. SERIAL_ACQUIRER is an indicator variable that takes the value of one if the acquirer was a bidder for another public U.S. target within the five years before the current deal, and zero otherwise. It measures general acquisition experience, regardless of the usage of toeholds. PAST_TOEHOLD_OWNER is an indicator variable that takes the value of one if the acquirer is a serial

acquirer and the last bid was with a toehold, and zero otherwise. It measures toehold-specific acquisition experience.[13]

The regression results presented in Table 6 show the effect of acquisition experience on the relation between toehold strategies and their thresholds. General acquisition experience seems to have a limited effect on toehold acquisitions. Serial acquirers are not more inclined to buy toeholds than acquirers who do not engage in repetitive acquisitions. The coefficients of EXPERIENCE measured by SERIAL_ACQUIRER are significantly negative in regressions of toehold size, indicating that serial acquirers tend to buy smaller toeholds compared to inexperienced acquirers. The interaction terms between THRESHOLD and SERIAL_ACQUIRER are not significant in the LPM regressions on the probability of toehold bidding. EXPERIENCE*THRESHOLD_WITH_TOEHOLD is significant at the 5% level in regressions on TOEHOLD_SIZE without time interaction (column 3) but loses its significance after controlling for the time trend (column 4).

[Insert Table 6 about here]

In comparison, toehold-specific acquisition experience has a far greater impact on the effectiveness of toehold acquisitions. The coefficients for experience (measured by PAST_TOEHOLD_OWNERS) are highly significant in regressions of the probability of toehold bidding, indicating that previous experience in executing toehold strategies increases the likelihood of acquirers buying toeholds. Moreover, the negative impact of the threshold on the probability of toehold bidding is reinforced if the acquirer is a past toehold owner. The coefficients of interactions between PAST_TOEHOLD_OWNER and THRESHOLD are significantly negative at the 1% level (in column 5 and 6). In the presence of toehold bidding, toehold-specific experience further amplifies the positive correlation between threshold and toehold size. Estimates

[13] To define acquisition experience, we look five years backwards from the current bid. If a firm launched an earlier bid for another public US target within 5 preceding years, the firm is classified as a serial acquirer. The dataset used to define the acquisition experience is constructed by following the same selection criteria as described in Section II.A (without the requirements on data availability in CRSP and Compustat, and target's relative size to acquirer) and the sample starts in 1985.

of EXPERIENCE*THRESHOLD_WITH_TOEHOLD are all significant and positive at the 1% level in the regressions on TOEHOLD_SIZE (in column 7 and 8).

To summarize, evidence suggests that it is toehold-specific experience that moves acquirers to stay away from toehold acquisitions or accumulate larger toeholds if they decide to acquire toeholds when the tradeoff between benefits and cost suggest that thresholds are high, contributing to the improvement in their takeover returns. General acquisition experience does not enhance acquirers' responsiveness to the toehold threshold.

VI. Robustness Checks and Extensions[14]

A. Validity of the Instrument

In this section[15], we provide more evidence that the exclusion condition of the instrumental variable is satisfied, as it is much more difficult to test (compared to the relevance condition, for which formal tests such as the weak instrument test are available).

A first potential concern for the violation of the exclusion condition is that acquirers with more experience in equity investment might be more capable in their acquisition of other firms, leading to a positive correlation between acquirers' CARs and ACQUIRER_EQUITY_INVESTMENT. However, the insignificant correlations between the instrument and the CARs in Table 4 mitigate this concern to some extent. Furthermore, Panel A of Table 7 compares the CARs of acquirers with positive equity investment to the CARs of acquirers with zero equity investment. The *t*-test of means and the Wilcoxon rank-sum test of medians both show no significant differences in acquirer CARs.

[Insert Table 7 about here]

[14] This section is greatly inspired by the helpful comments of the anonymous referee.

[15] In Section IV, we verified the relevance condition of the instrument by the first stage coefficient significance and the standard weak instrument tests. We also performed an informal test on the exclusion condition, by showing that the correlations between ACQUIRER_EQUITY_INVESTMENT and CARs are insignificant.

As endogeneity in the regressions is caused by unobservable variables that determine both acquirer returns and the execution of toehold acquisitions, a second potential concern for a violation of the exclusion condition is that the instrument might be correlated with unobservable variables such as the acquirers' private target values or private benefits concerning control of the target's management. If, for instance, only acquirers with high private target values invest, their toehold holdings might be associated with higher acquirer returns. In contrast, if only acquirers that face more target management resistance invest, their toeholds might result in lower returns. To test whether this is a legitimate concern, we perform additional analyses on acquirer CARs in deals with toeholds (Panel B of Table 7). We run separate regressions based on whether acquirers invest in equity. Our findings show that toeholds perform similarly in toehold strategies with or without equity investment. Coefficient estimates of toehold size are of similar magnitude, and their differences, reflected by the coefficient estimate of TOEHOLD_SIZE* POSITIVE_ACQUIRER_EQUITY_INVESTMENT, are insignificant for both ACQUIRER_CAR[-41,1] and ACQUIRER_CAR[-41, END]. These tests suggest that toeholds do not perform differently for acquirers investing in equity.

A third potential concern is that acquirers that invest in equity are driven by an ambition to "build an empire," and therefore tend to invest excessively and inefficiently. There is compelling evidence against this argument. First, as empire builders create less value or destroy value in acquisitions, the instrumented toehold variables should be associated with negative coefficients, which is opposite to our findings in Section IV. Second, we compare the proportion of serial acquirers (as a proxy for empire builders) in the groups of acquirers with and without equity investment. As is shown in Panel C of Table 7, we find no evidence that acquirers with equity investment are more likely to be serial acquirers. Furthermore, given that an acquirer has experience in acquisitions, there is no difference in the number of transactions executed by acquirers with and without equity investment.

B. Toehold Performance with Propensity Score Matching

Toehold bidding is strongly associated with certain types of takeover transactions, as can be seen in Table 2. In the presence of a toehold, the takeover is more likely to involve a poison pill, be in the form of a tender offer, be paid with 100% cash, have a hostile attitude, and involve multiple bidders. This suggests that the adoption of a toehold strategy is not random; hence, the IV regression in Section IV.

As a robustness check, we use propensity score matching (PSM) as another method of dealing with the non-random assignment of toeholds (Li and Prabhala (2007)). First, we run a Probit regression of the probability of toehold bidding to generate propensity scores for each deal. Second, we match each deal executed with a toehold with a non-toehold bid announced in the same year that has the closest propensity score. Third, we run OLS regressions and check the correlation between toeholds and acquirer returns in the matched sample.

PSM serves several purposes. First, it is a method of pinning down the treatment effect. Because propensity score generation uses the full set of target, acquirer, and deal characteristics as controls, estimates with the matched toehold and non-toehold bids are less biased by the high correlation between toehold adoption and certain target, acquirer, and deal characteristics. Second, there are only a few observations of acquisitions executed with toeholds compared to those executed without toeholds. PSM, therefore, helps to create a more balanced sample of toehold and non-toehold strategies. Third, estimates with PSM help to investigate the robustness of efficiency improvement in toehold performance. As the findings in Section V indicate, acquirers tend to buy larger toeholds over time and thereby become more responsive to the toehold threshold when selecting toehold size. If the improvement in toehold performance comes from larger toeholds, the coefficients of TOEHOLD*TIME should still be positive even after matching for the probability of toehold bidding.

Table 8 presents the estimates obtained with the matched sample. We matched 66 takeovers with toeholds with non-toehold takeovers with similar propensity scores, resulting in 132 observations in total. As expected, the coefficients of TOEHOLD*TIME are positive and are significant at the 1% level in regressions of ACQUIRER_CAR[-41,1] on the toehold dummy (column 2) and significant at the 10%

level in the regression of ACQUIRER_CAR[-41, END] on the toehold size (column 8). The performance improvement of toeholds over time still exists in deals with similar probabilities of toehold bidding, indicating a more efficient use of toeholds. As is shown in Section V, such efficiency improvements can be attributed to more toeholds exceeding toehold thresholds.

[Insert Table 8 about here]

C. Toehold Acquisition and Management Resistance: Further Evidence Based on Deal Attitude

As we have argued, making a toehold acquisition is an endogenous decision, and management resistance is an important factor that affects whether and at what size a toehold acquisition is made. This argument is supported by several pieces of evidence. First, toeholds are more likely to be acquired when the takeover context is difficult, involving poison pills, tender offers, pure cash payment, hostile attitude, and multiple bidders. Second, the IV regression shows that unobservable factors that influence a toehold acquisition lead to a downward bias in toehold performance, which is consistent with the management resistance argument.

[Insert Table 9 about here]

In this section, we directly test the relation between management resistance and the occurrence of a toehold acquisition. The tests are carried out in three steps. First, we run an OLS regression of deal attitude on toeholds and other control variables. Column 1 and 4 of Table 9 report the estimation results. Without controlling for endogeneity, a hostile deal attitude is positively correlated with the occurrence of toehold acquisitions. Coefficients of toeholds (measured by either a toehold dummy or toehold size) are positive. Moreover, the estimate of the toehold dummy is significant at the 1% level with a coefficient of 0.815, suggesting that the existence of toeholds is related to an increase in the probability of management resistance by 81.5%. Second, we perform IV regressions to address the endogeneity in toehold acquisitions. Confirming previous findings, instrumented toeholds no longer exhibit a positive relation with a hostile deal attitude (see columns 2 and 5 of Table 9). This again supports the interpretation that management resistance is a determinant in an endogenous toehold decision rather than the concesequence

of a toehold acquisition. Third, we repeat the OLS regressions in the matched sample based on the propensity score of toehold bidding. Using propensity score matching, we find that toeholds are negatively related to a hostile deal attitude. The coefficient of TOEHOLD_SIZE is -0.590 and significant at the 1% level. It suggests that, after controlling for endogeneity, toeholds help acquirers to reduce management resistance.

D. Non-threshold Bidding and Acquirer Returns

As proposed by Betton et al. (2009), the toehold threshold provides the optimal toehold size, considering the trade-off between toehold costs and benefits. In this section, we analyze the cost of bidding for toeholds when the toehold size deviates from this threshold.

[Insert Table 10 about here]

We measure the deviation from threshold bidding by the variable TOEHOLD-THRESHOLD, which is equal to the difference between the observed toehold size and the threshold in each toehold strategy. As discussed in Betton et al. (2009), the toehold threshold is the smallest toehold that makes the acquirer indifferent between toehold bidding and non-toehold bidding. That is, it measures the size of the toehold that makes toehold benefits equal to the costs of management resistance. When the toehold benefits increase with toehold size, a larger toehold would result in a higher acquirer return. Yet, buying a very large toehold is costly as the acquisition costs increase quickly in the acquired stake. For instance, significant stock transactions are likely to alert the market about the potential takeover, leading to a high runup of the target's stock. Thus, we expect a non-linear relation between the acquirer abnormal returns and non-threshold bidding. Table 10 presents the regressions of acquirer returns on TOEHOLD-THRESHOLD and its squared term, $(\text{TOEHOLD-THRESHOLD})^2$. We report results in both the full sample and the toehold-only subsample. Consistently with the expected non-linear relation, we observe that acquirer returns increase in TOEHOLD-THRESHOLD but decrease in $(\text{TOEHOLD-THRESHOLD})^2$. This implies that a large toehold that exceeds the threshold generates high returns to acquirers. Yet, it is

not a mere "the larger, the better," as the extra benefit brought by a large toehold decreases when the toehold size becomes too large.

E. Bidders' Learning: Further Evidence from an Expanded Toehold Sample

In previous sections, we find that toehold experience helps acquirers make better decisions on whether to buy a toehold in the first place and on the size of the toehold. In this section, we further explore this learning mechanism and analyze the effect a sub-threshold bid on subsequent toehold acquisitions. The fact that less than 5% of takeovers involve toehold strategies raises a practical challenge in collecting sufficient observations of past toehold acquisitions. To overcome this limitation, we expand our sample by including non-public U.S. acquirers into the sample and dropping the data availability requirement for CRSP and Compustat as well.[16] [17] This leads to an expanded toehold sample of 568 toehold strategies, among which 123 deals have available data on LAGGED(TOEHOLD-THRESHOLD). LAGGED(TOEHOLD-THRESHOLD) refers to the difference between the observed toehold size and threshold in the last takeover with toeholds. With this variable, we can check how sub-threshold bidding in the last toehold strategy affects current toehold size.

[Insert Table 11 about here]

Column 1 of Table 11 presents an OLS regression of toehold size on the threshold using this expanded toehold sample. The results confirm the previous findings that toehold size is positively affected by the threshold. THRESHOLD has a coefficient of 0.147, which is significant at the 5% level. In Column 2 of Table 11, we relate TOEHOLD-THRESHOLD of the current toehold strategy to LAGGED(TOEHOLD-THRESHOLD). Our previous findings show that threshold bidding helps to increase acquirer returns. If past toehold owners do learn, we expect them to correct the sub-optimal

[16] We keep the requirement for the public status of target because buying minority stake of a private target differs significantly from buying a minority stake of a public target.

[17] The primary limitation of the extended dataset is that data on stock returns and the instrumental variable ACQUIRER_EQUITY_INVESTMENT is not available in many cases as we include private acquirers.

decision on proper toehold size over time. More specifically, we expect a negative coefficient of LAGGED(TOEHOLD-THRESHOLD) in the regression of the current TOEHOLD-THRESHOLD. The estimation result presented in column 2 of Table 11 does confirm this expectation. LAGGED(TOEHOLD-THRESHOLD) has a coefficient of -0.289 and is significant at the 5% level.

Additionally, we also use the expanded sample to study if bidding with toeholds at the threshold level helps to pre-empt target hostility. Conditional on using a toehold, the distance between the toehold and the threshold may trigger various levels of target resistance. As this question is relevant in the toehold-only subsample, we analyze it on the extended data to have a sufficient number of toehold observations. Column 3 of Table 11 reports the estimation results. Consistent with the expectation, we find that the difference between the observed toehold and the threshold is negatively related to target hostility. The coefficient of Toehold-Threshold is negative and significant at the 10% level.

F. Other Tests

We find that toehold-specific experience helps to improve the toehold acquisition decision, but that general takeover experience does not. Besides differences in the type of experience, are serial toehold acquirers different from serial non-toehold acquirers? To address this question, we compare the takeover performance, target, acquirer, and deal characteristics as well as the frequency of serial acquisitions between the serial toehold acquirers (i.e. past toehold owners) and serial non-toehold acquirer (i.e. serial acquirers that are not past toehold owners). The only significant difference we observe is that serial toehold acquirers are more likely to place bids in the form of tender offers, compared to serial non-toehold acquirers. This difference is consistent with the argument that toeholds are more likely to be used in difficult takeovers. Besides this deal characteristics, the fact that serial toehold acquirers do not differ from serial non-toehold acquirers suggests that the learning results are not driven by the acquirer characteristics.[18]

[18] The relevant table is reported in the online Appendix.

VII. Conclusion

In a long-term study over the period between 1990 and 2014, we reconfirm that toehold acquisitions have decreased over time. Scarce use and apparent low returns of toehold strategies in corporate acquisitions raise an important question: Have toehold strategies become obsolete over time? The overall economic story and evidence presented in this study suggest they have not. We find that, when controlling for unobserved endogeneity of toehold-based acquisitions, toehold holdings have a positive relationship with acquirer returns and that returns to acquirers in takeovers with toeholds have increased over time.

We argue and present evidence that this improvement in the execution of toehold strategies is associated with the use of toeholds in difficult acquisitions and a more effective determination of toehold size by acquirers. Specifically, acquirers accumulate larger toeholds when optimal thresholds for effective toeholds are high, and this relationship becomes stronger over time. Furthermore, we show that the improvement in toehold performance is related to acquirers' specific experience. Our evidence suggests that learning-by-doing helps acquirers to buy toeholds of sufficient size so that they will improve their returns in takeovers.

Although toehold-specific experience can help acquirers to make better toehold decisions, this does not hold for general acquisition experience. In this respect, our study also contributes to the debate on whether there is a learning effect in serial acquisitions. Consistently with Aktas, de Bodt, and Roll (2013), we find that serial acquirers do learn from similar deals. Uniquely in the literature, we show that the learning effect can occur at the strategy level, i.e., past toehold experience can improve the effective adoption of toehold strategy in following acquisitions. Hence, our paper complements the learning evidence based on other performance measures such as stock returns, acquisition premium, and time between deals.

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Table 1. Corporate takeovers over the period 1990-2014

This table shows the distribution of deals over the years, the number and percentage of deals with toeholds, the average toehold size in toehold bidding, the number of deals done by serial acquirers, and the number of deals done by past toehold owners. Our sample consists of 1,661 deals announced between January 1, 1990 and December 31, 2014, extracted from the SDC database. All the deals are announced deals for public U.S. targets by public U.S. acquirers. Data on each deal must be available from the CRSP database, and each deal is required to have data on equity investment from the Compustat database. Rumored deals are excluded. Targets must have a capitalization of no less than 5% of the acquirer's market value at 42 days before the announcement date.

Year	No. of takeover deals	No. of toehold strategies	Percent of toehold strategies (%)	Average toehold size (%)	No. of deals done by serial acquirers	No. of deals done by past toehold owners
1990	30	5	16.67%	17.68%	9	0
1991	27	1	3.70%	4.87%	7	1
1992	30	4	13.33%	2.91%	10	2
1993	39	2	5.13%	29.70%	5	1
1994	74	5	6.76%	5.63%	13	3
1995	89	10	11.24%	17.74%	16	2
1996	104	5	4.81%	17.29%	25	7
1997	147	6	4.08%	18.17%	41	3
1998	140	7	5.00%	11.63%	33	4
1999	130	3	2.31%	10.18%	30	3
2000	111	3	2.70%	6.97%	23	1
2001	87	4	4.60%	26.06%	21	0
2002	41	0	0.00%	.	15	1
2003	62	2	3.23%	35.53%	18	1
2004	76	1	1.32%	11.77%	9	0
2005	59	0	0.00%	.	12	2
2006	58	1	1.72%	24.46%	12	1
2007	65	0	0.00%	.	4	1
2008	44	1	2.27%	15.30%	5	1
2009	39	1	2.56%	29.23%	1	2
2010	41	0	0.00%	.	4	0
2011	34	1	2.94%	46.00%	1	0
2012	46	2	4.35%	16.70%	8	1
2013	47	0	0.00%	.	5	1
2014	41	4	9.76%	25.39%	6	1
Total/Average	1,661	68	4.09%	18.66%	333	39

Table 2. Overview of takeover efficiency and deal characteristics

This table presents the summary statistics of the deals in our sample. We measure takeover efficiency by returns to acquirers. Abnormal returns are estimated using the following regression specification in Betton et al. (2008a):

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=1}^{K} AR_{jk} d_{kt} + \varepsilon_{jt}, \quad t = day\{-293, ..., end\},$$

where r_{jt} is the return to firm j over day t, r_{mt} is the value-weighted market return, and d_{kt} is a dummy variable that takes the value of 1 if day t is in the k^{th} event window, and 0 otherwise. The end date is defined as the earlier of the target delisting date and the day of the last bid in the contest plus 126 trading days. The CAR to firm j over event period k is $\text{CAR}_{\text{jk}} = \omega_k \text{AK}_{\text{jk}}$, where ω_k is the number of trading days in the event window. MVE measures the market value of the firm's equity and is recorded in millions and adjusted to the 2014 price level. TARGET_RUNUP measures the CAR to the target over the runup period [-41, -2] using a value-weighted market return model estimated over [-293, end]. PENNY_STOCK is a dummy variable that takes the value of 1 if the stock price on day -42 is less than $1, and zero otherwise. TURNOVER is calculated as the average daily trading volume of the target stock as a fraction of total shares outstanding over the time window [-293, -42]. NYSE|AMEX denotes whether the firm is listed on the NYSE or AMEX exchange. HORIZONTAL is a dummy that takes the value of 1 if the target and acquirer are in the same 2-digit SICs, and 0 otherwise. POISON_PILL, TENDER_OFFER, ALL_CASH, and HOSTILE are indicator variables equal to 1 if the deal uses a poison pill, is in the form of a tender offer, is made with a 100% cash payment, or the deal attitude is hostile, respectively. NUMBER_OF_ACQUIRERS reports the number of acquirers bidding for the same target. A list of variable definitions can be found in the online Appendix. For each variable, we report the mean and the median (in parentheses). The significance of difference in medians is based on a two-sample Wilcoxon rank-sum test. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

	Full sample	Toehold strategies	Non-toehold strategies	Difference	t-stat (z-value)
A. Performance measure					
ACQUIRER_CAR[-41, 1]	-0.005	-0.002	-0.005	0.003	0.102
	(-0.009)	*(0.000)*	*(-0.010)*	*(0.010)*	*(0.416)*
ACQUIRER_CAR[-41, END]	-0.086	-0.026	-0.089	0.063	0.737
	(-0.069)	*(-0.050)*	*(-0.070)*	*(0.020)*	*(0.736)*
B. Target characteristics					
TARGET_MVE ($millions, 2014)	1,462,984	1,398,382	1,465,742	-67,360	-0.108
	(245,815)	*(183,091)*	*(248,908)*	*(-65,817)*	*(-0.075)*
TARGET_RUNUP	0.053	0.021	0.054	-0.033	-1.112
	(0.035)	*(0.034)*	*(0.035)*	*(-0.001)*	*(-0.592)*
TARGET_PENNY_STOCK	0.022	0.029	0.021	0.008	0.447
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.447)*
TARGET_TURNOVER	0.006	0.005	0.006	-0.001	-0.762
	(0.004)	*(0.003)*	*(0.004)*	*(-0.001)*	*(-0.577)*
TARGET_NYSE|AMEX	0.335	0.397	0.332	0.065	1.112
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(1.112)*
C. Acquirer characteristics					
ACQUIRER_MVE ($millions, 2014)	6,323,279	7,273,071	6,282,735	990,336	0.283
	(1,129,001)	*(923,952)*	*(1,144,474)*	*(-220,522)*	*(-0.892)*
ACQUIRER_PENNY_STOCK	0.002	0.000	0.003	-0.003	-0.414
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(-0.414)*
ACQUIRER_TURNOVER	0.007	0.005	0.007	-0.003	-2.129**
	(0.004)	*(0.003)*	*(0.004)*	*(-0.001)*	*(-2.714**)*
ACQUIRER_NYSE|AMEX	0.495	0.662	0.488	0.174	2.816**

	(0.000)	*(1.000)*	*(0.000)*	*(1.000)*	*(2.810**)*
HORIZONTAL	0.420	0.441	0.419	0.022	0.368
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.368)*
D. Deal characteristics					
POISON_PILL	0.013	0.074	0.011	0.063	4.464***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(4.439***)*
TENDER_OFFER	0.136	0.368	0.126	0.241	5.740***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(5.686***)*
ALL_CASH	0.213	0.338	0.207	0.131	2.591***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(2.587***)*
HOSTILE	0.045	0.250	0.036	0.214	8.563***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(8.382***)*
NUMBER_OF_ACQUIRERS	1.107	1.191	1.104	0.088	1.727*
	(1.000)	*(1.000)*	*(1.000)*	*(0.000)*	*(2.104**)*

Table 3. Regressions on acquirer CARs

This table reports estimation results by regressing acquirer returns to toehold measures and a set of control variables. Panel A reports regression results using the full sample. TOEHOLD_DUMMY is an indicator equal to 1 if the deal involved a toehold, and TOEHOLD_SIZE is a continuous measure of the percentage of the target's share owned by the acquirer before the takeover announcement. TIME (in years) is defined as the difference between the observation year and the base year of 1990. TARGET(ACQUIRER)_SIZE equals the natural logarithm of the firm's equity market value. Targets' industries are defined by their primary SIC as manufacturer, service, trade, finance, and others. Panel B reports regression results by dropping observations that took place during the merger wave (1994-2001). All the other variables are defined as in Table 2. The standard error is clustered at the acquirers' firm level. For each variable, we report the coefficient and standard error (in parentheses). *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Panel A: Performance of toeholds over time

	[TOEHOLD = TOEHOLD_DUMMY]				[TOEHOLD = TOEHOLD_SIZE]			
Dependent variable:	ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]		ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOEHOLD	-0.005	-0.119***	0.014	-0.140	0.047	-0.290	0.139	-0.644
	(0.020)	(0.044)	(0.083)	(0.176)	(0.087)	(0.232)	(0.298)	(0.492)
TOEHOLD*TIME		0.009***		0.012		0.000*		0.001**
		(0.003)		(0.010)		0.000		0.000
TIME		0.001		0.006**		0.001		0.006**
		(0.001)		(0.003)		(0.001)		(0.003)
TARGET_SIZE	0.014**	0.013**	0.030	0.025	0.014**	0.013**	0.030	0.025
	(0.006)	(0.006)	(0.019)	(0.019)	(0.006)	(0.006)	(0.019)	(0.019)
TARGET_RUNUP	0.188***	0.188***	0.240**	0.245**	0.189***	0.189***	0.241**	0.244**
	(0.036)	(0.036)	(0.115)	(0.115)	(0.036)	(0.036)	(0.115)	(0.115)
TARGET_PENNY_STOCK	0.111*	0.107*	0.126	0.107	0.110*	0.107*	0.124	0.108
	(0.060)	(0.060)	(0.218)	(0.218)	(0.060)	(0.060)	(0.218)	(0.219)
TARGET_TURNOVER	-1.708	-1.813	-9.364**	-9.751**	-1.701	-1.771	-9.342**	-9.687**
	(1.258)	(1.253)	(4.375)	(4.396)	(1.256)	(1.259)	(4.375)	(4.402)
TARGET_NYSE|AMEX	0.013	0.012	0.068**	0.061*	0.014	0.012	0.068**	0.061*
	(0.011)	(0.011)	(0.034)	(0.035)	(0.011)	(0.011)	(0.034)	(0.035)
ACQUIRER_SIZE	-0.029***	-0.029***	-0.077***	-0.078***	-0.029***	-0.029***	-0.077***	-0.078***
	(0.006)	(0.006)	(0.018)	(0.018)	(0.006)	(0.006)	(0.018)	(0.018)
ACQUIRER_TURNOVER	1.173	1.101	-1.731	-2.150	1.181	1.090	-1.728	-2.164
	(1.221)	(1.252)	(6.310)	(6.486)	(1.218)	(1.254)	(6.306)	(6.487)
ACQUIRER_PENNY_STOCK	0.130	0.127	0.587*	0.573*	0.131	0.128	0.588*	0.572*
	(0.082)	(0.085)	(0.325)	(0.345)	(0.082)	(0.086)	(0.326)	(0.345)
ACQUIRER_NYSE|AMEX	0.044***	0.045***	0.104***	0.110***	0.044***	0.046***	0.104**	0.110***
	(0.011)	(0.011)	(0.040)	(0.040)	(0.011)	(0.011)	(0.040)	(0.041)
HORIZONTAL	0.006	0.007	0.023	0.023	0.006	0.006	0.023	0.023
	(0.010)	(0.010)	(0.033)	(0.033)	(0.010)	(0.010)	(0.033)	(0.033)
POISON_PILL	0.007	0.002	0.007	-0.008	0.007	0.006	0.008	-0.001
	(0.031)	(0.029)	(0.131)	(0.130)	(0.031)	(0.030)	(0.132)	(0.130)
TENDER_OFFER	0.039**	0.042**	0.083	0.092	0.038**	0.040**	0.082	0.090
	(0.018)	(0.018)	(0.077)	(0.077)	(0.018)	(0.018)	(0.076)	(0.076)
ALL_CASH	0.029**	0.026**	0.187***	0.170***	0.029**	0.026**	0.187***	0.171***
	(0.012)	(0.012)	(0.038)	(0.040)	(0.012)	(0.012)	(0.038)	(0.040)
HOSTILE	-0.052**	-0.044**	-0.110	-0.089	-0.053**	-0.049**	-0.109	-0.092
	(0.022)	(0.022)	(0.117)	(0.116)	(0.021)	(0.021)	(0.115)	(0.114)

NUMBER_OF_ACQUIRERS			0.065	0.066			0.065	0.066
			(0.043)	(0.043)			(0.042)	(0.042)
DEAL_COMPLETE			0.029	0.024			0.029	0.023
			(0.070)	(0.070)			(0.070)	(0.070)
CONSTANT	0.184***	0.187***	0.401**	0.393*	0.182***	0.182***	0.400**	0.391*
	(0.049)	(0.049)	(0.200)	(0.201)	(0.049)	(0.049)	(0.199)	(0.200)
Year dummy	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes	yes	yes
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
N	1,661	1,661	1,661	1,661	1,661	1,661	1,661	1,661
R-squared	0.11	0.114	0.075	0.078	0.11	0.113	0.075	0.078

Panel B: Performance of toeholds (excluding takeovers announced in the takeover wave from 1994 to 2001)

	[TOEHOLD = TOEHOLD_DUMMY]				[TOEHOLD = TOEHOLD_SIZE]			
Dependent variable:	ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]		ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
TOEHOLD	0.018	-0.147**	0.144	0.047	0.090	-0.444	0.097	-1.005*
	(0.037)	(0.069)	(0.102)	(0.253)	(0.132)	(0.395)	(0.328)	(0.593)
TOEHOLD*TIME		0.010***		0.006		0.000*		0.001**
		(0.003)		(0.011)		(0.000)		(0.000)
TIME		0.000		-0.002		0.000		-0.002
		(0.001)		(0.003)		(0.001)		(0.003)
Control variables	yes	yes	yes	yes	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes	yes	yes
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
N	779	779	779	779	779	779	779	779
R-squared	0.119	0.13	0.094	0.095	0.12	0.125	0.092	0.094

Table 4: Instrumental Variable Regressions

This table reports the results of the instrumental regressions on acquirer CARs and several IV test. The endogenous variable is TOEHOLD, and the instrument is ACQUIRER_EQUITY_INVESTMENT, which is defined of the total equity investment of the acquirer firm (excluding its minority stake investment in the target) divided by total assets in the last annual financial report before the takeover announcement. Panel A reports the results of 2SLS IV regressions and the first stage regressions, respectively. Panel B reports the correlation coefficients between IV, TOEHOLD_SIZE, and ACQUIRER_CAR*s* and the tests of weak instrument. For regression outcomes, both estimated coefficients and standard error (in parentheses) are reported. For tests, both test value and p-value (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Panel A: Two-stage least squares (2SLS)

A.I. 2SLS outcome

	[TOEHOLD = TOEHOLD_DUMMY]		[TOEHOLD = TOEHOLD_SIZE]	
Dependent variable:	ACQUIRER_CAR[-41, 1]	ACQUIRER_CAR[-41, END]	ACQUIRER_CAR[-41, 1]	ACQUIRER_CAR[-41, END]
	(1)	(2)	(3)	(4)
TOEHOLD	0.115	1.006*	0.492	4.279*
(S.E.)	(0.142)	(0.538)	(0.605)	(2.326)
Method	2SLS IV	2SLS IV	2SLS IV	2SLS IV
N	1,661	1,661	1,661	1,661

A.II. 1st stage estimate

	[TOEHOLD = TOEHOLD_DUMMY]		[TOEHOLD = TOEHOLD_SIZE]	
Dependent variable:	TOEHOLD		TOEHOLD	
	(5)	(6)	(7)	(8)
ACQUIRER_EQUITY_INVESTMENT	0.906***	0.900***	0.213***	0.211***
(S.E.)	(0.160)	(0.160)	(0.037)	(0.037)
METHOD	OLS	OLS	OLS	OLS
N	1,661	1,661	1,661	1,661

Panel B: Tests of IV and endogeneity

B.I. Correlation coefficient between IV, toehold size, acquirer returns

	TOEHOLD_SIZE	ACQUIRER_CAR[-41, 1]	ACQUIRER_CAR[-41, END]
	(9)	(10)	(11)
ACQUIRER_EQUITY_INVESTMENT	0.1565***	0.0093	0.0268
(p-value)	(0.000)	(0.705)	(0.275)

B.II. Test of weak instrument

	(12)	(13)	(14)	(15)
F-value	8.792***	8.691***	6.701***	6.653**
(p-value)	(0.003)	(0.003)	(0.010)	(0.010)
Minimum eigenvalue statistic	32.187	31.643	33.672	33.178
2SLS Size of nominal 5% Wald test (10% critical value)	16.380	16.380	16.380	16.380
LIML Size of nominal 5% Wald test (10% critical value)	16.380	16.380	16.380	16.380

Table 5: Toehold threshold and toehold bidding

This table reports the coefficient estimates in the regressions on the probability of toehold bidding and toehold size. The threshold is computed using the formula in Betton et al. (2009), $\hat{\alpha} = -k_1 + \sqrt{k_1^2 + k_2}$,where $\hat{\alpha}$ refers to the toehold threshold, $k_1 = v - r - \frac{1}{2}(v^2 - t^2) - t/(1-\theta)$, and $k_2 = r(2v - r) + [2(1-\theta) - t]$. v stands for the acquirer's private valuation with assumed distribution $v \sim U[0,1]$, and can be proxied by the initial offer premium. The termination fee t is the average fee for controlling bids in the same industry and year, reflecting in part the bidder's opportunity loss of a merger termination agreement. The probability θ of takeover failure is estimated from a Probit model regressed on the probability of deal completion (*DEAL_COMPLETE*) with a set of explanatory variables (TARGET_SIZE, TARGET_TURNOVER, TARGET_PENNY_STOCK, TARGET_NYSE|AMEX, POISON_PILL, HORIZONTAL, TENDER_OFFER, ALL_CASH, and year dummies). The resistance cost r is $r = -(1-v) + \sqrt{(1-v)^2 + \frac{2t}{1-\theta} - t^2}$. Control variables include ACQUIRER_EQUITY_INVESTMENT, TARGET_SIZE, TARGET_TURNOVER TARGET_PENNY_STOCK, TARGET_NYSE|AMEX, ACQUIRER_SIZE, ACQUIRER_TURNOVER, ACQUIRER_PENNY_STOCK, ACQUIRER_NYSE|AMEX, POISON_PILL, HORIZONTAL, TENDER_OFFER, and ALL_CASH. For each variable, both the coefficient and standard error (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Dependent variable:	PROBABILITY_OF_TOEHOLD_BIDDING		TOEHOLD_SIZE	
	(1)	(2)	(3)	(4)
THRESHOLD	-0.208**	-0.248		
	(0.084)	(0.356)		
THRESHOLD*TIME		0.006		
		(0.017)		
THRESHOLD_WITH_TOEHOLD			1.187***	-0.387
			(0.229)	(0.419)
THRESHOLD_WITH_TOEHOLD*TIME				0.126***
				(0.033)
TIME		-0.003*		0.000
		(0.002)		(0.000)
Control variables	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes
Model	OLS	OLS	OLS	OLS
N	1,550	1,550	1,550	1,550
R-squared	0.068	0.073	0.225	0.286

Table 6: Acquisition experience and toehold bidding

This table reports estimates in regressions on the probability of toehold bidding and toehold size based on acquisition experience. SERIAL_ACQUIRER is an indicator variable that takes a value of 1 if the acquirer has bid for another public U.S. target in the five years before the current deal, and 0 otherwise. PAST_TOEHOLD_OWNER is an indicator variable that takes a value of 1 if the acquirer is a serial acquirer and the last bid is with toeholds, and 0 otherwise. Control variables are the same as in Table 5. For each variable, both the coefficient and standard error (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

	[EXPERIENCE = SERIAL_ACQUIRER]				[EXPERIENCE =PAST_TOEHOLD_OWNER]			
Dependent variable:	PROBABILITY_OF_TOEHOLD_BIDDING		TOEHOLD_SIZE		PROBABILITY_OF_TOEHOLD_BIDDING		TOEHOLD_SIZE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
THRESHOLD	-0.117	-0.037			-0.157**	-0.168		
	(0.098)	(0.425)			(0.078)	(0.350)		
EXPERIENCE*THRESHOLD	0.057	0.046			-2.340***	-2.397***		
	(0.178)	(0.188)			(0.882)	(0.872)		
THRESHOLD_WITH_TOEHOLD			0.916***	-0.411			1.136***	-0.274
			(0.230)	(0.409)			(0.220)	(0.392)
EXPERIENCE*THRESHOLD_WITH_TOEHOLD			0.915**	0.447			3.810***	2.912***
			(0.448)	(0.464)			(0.693)	(0.623)
THRESHOLD*TIME		-0.004				0.004		
		(0.019)				(0.017)		
THRESHOLD_WITH_TOEHOLD*TIME				0.117***				0.114***
				(0.037)				(0.032)
EXPERIENCE	-0.009	-0.008	-0.004**	-0.004**	0.272***	0.271***	0.013	0.014
	(0.020)	(0.020)	(0.002)	(0.001)	(0.099)	(0.097)	(0.016)	(0.015)
TIME		-0.003		-0.001		-0.003*		0.000
		(0.004)		(0.001)		(0.002)		(0.000)
Control variables	yes	yes	yes	yes	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes	yes	yes
Model	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
N	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550
R-squared	0.095	0.095	0.259	0.305	0.088	0.093	0.26	0.309

Table 7: Several tests for the validity of the instrument

This table reports several tests of the validity of the instrument. Panel A compares the acquirer CARs of deals done by acquirers with positive equity investment with those made by acquirers with no/(zero) equity investment. The comparison is performed for all the observations with available data on the acquirers' equity investment. The comparison of means is by *t*-test, and the t-statistics are reported. The comparison of medians is by Wilcoxon rank-sum, and the z-value is reported. Panel B tests whether toeholds perform differently for acquirers with/without equity investment. Both the coefficients and standard errors (in parentheses) are reported. Panel C tests whether acquirers with positive equity investment tend to acquire more frequently than others. It investigates whether an acquirer with positive equity investment is more likely to be a serial acquirer, and among serial acquirers, whether acquirers with positive equity investment tend to carry out more acquisitions. For this comparison, both the means and the median (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Panel A. Comparison of Acquirer CARs based on acquirers' equity investment

		Acquirers with positive equity investment	Acquirers with zero equity investment	Difference	t-stat (*z-value)*
ACQUIRER_CAR[-41, 1]	Mean	0.005	-0.007	0.011	0.812
	(Median)	*(-0.007)*	*(-0.009)*	*(0.002)*	*(-1.157)*
ACQUIRER_CAR[-41, END]	Mean	-0.034	-0.097	0.064	1.422
	(Median)	*(-0.074)*	*(-0.068)*	*(-0.006)*	*(-0.858)*

Panel B. Do toehold perform differently for acquirers with equity investment?

		ACQUIRER_CAR[-41, 1]			ACQUIRER_CAR[-41, END]		
		Toehold strategies with positive acquirer equity investment	Toehold strategies with zero acquirer equity investment	Toehold strategies with available data on acquirer equity investment	Toehold strategies with positive acquirer equity investment	Toehold strategies with zero acquirer equity investment	Toehold strategies with available data on acquirer equity investment
TOEHOLD_SIZE		0.24	0.392	0.213	0.374	1.575	0.308
	(S.E.)	(0.241)	(0.255)	(0.196)	(0.883)	(1.234)	(0.789)
TOEHOLD_SIZE *POSITIVE_ACQUIRER_EQUITY_INVESTMENT				0.113			0.653
	(S.E.)			(0.282)			(0.922)
POSITIVE_ACQUIRER_EQUITY_INVESTMENT				-0.04			-0.269
	(S.E.)			(0.069)			(0.274)
Control variables		yes	yes	yes	yes	yes	yes
Year dummy		yes	yes	yes	yes	yes	yes
Industry dummy		yes	yes	yes	yes	yes	yes
R-squared		0.805	0.555	0.428	0.834	0.609	0.392
N		27	41	68	27	41	68

Table 7 (continued)

Panel C. Are acquirers with investment at equity "empire builder"?

		Acquirers with positive investment at equity	Acquirers with zero investment at equity	Difference	t-stat (*z-value)*
Proportion of serial acquirers among all acquirers	Mean	0.167	0.206	-0.039	-1.494
	(Median)	*(0.000)*	*(0.000)*	*(0.000)*	*(-1.493)*
Average number of previous acquisitions among serial acquirers	Mean	1.563	1.477	0.085	0.486
	(Median)	*(1.000)*	*(1.000)*	*(0.000)*	*(-1.344)*

Table 8: Toehold performance with propensity score matching (PSM)

This table reports the results of OLS regressions on acquirer CARs with a matched sample of toehold and non-toehold biddings. The matching is based on propensity scores from a Probit regression on the probability of toehold bidding, with ACQUIRER_EQUITY_INVESTMENT, TARGET_SIZE, TARGET_PENNY_STOCK, TARGET_TURNOVER, TARGET_NYSE|AMEX, ACQUIRER_SIZE, ACQUIRER_PENNY_STOCK, ACQUIRER_TURNOVER, ACQUIRER_NYSE|AMEX, POISON_PILL, HORIZONTAL, TENDER_OFFER, ALL_CASH, HOSTILE and Industry dummies as explanatory variables. Each toehold deal is matched with a non-toehold deal with the closest propensity score in the same year of deal announcement. The control variables are the same as in Table 3. Panel A reports the toehold performance in the matched sample, and Panel B reports summary statistics of propensity scores in toehold and non-toehold strategies. For each variable estimate, we report the coefficient and standard error (in parentheses). *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Panel A: Toehold performance with PSM

	[TOEHOLD = TOEHOLD_DUMMY]				[TOEHOLD = TOEHOLD_SIZE]			
Dependent variable:	ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]		ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOEHOLD	-0.038	-0.233***	-0.08	-0.51	0.044	-0.302	0.089	-1.047
	(0.031)	(0.079)	(0.125)	(0.392)	(0.113)	(0.285)	(0.369)	(0.759)
TOEHOLD*TIME		0.015***		0.033		0.000		0.001*
		(0.005)		(0.024)		(0.000)		(0.000)
TIME		-0.004		-0.006		0.001		0.001
		(0.004)		(0.019)		(0.004)		(0.014)
ACQUIRER_INVESTMENT_IN_EQUITY	-0.195	-0.315	0.157	-0.146	-0.16	-0.221	0.248	0.026
	(0.212)	(0.200)	(0.798)	(0.751)	(0.193)	(0.203)	(0.771)	(0.767)
Control variable	yes	yes	yes	yes	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes	yes	yes
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
N	132	132	132	132	132	132	132	132
R-squared	0.211	0.288	0.156	0.183	0.2	0.224	0.153	0.169

Panel B: Propensity score in the matched sample

	Mean	Std. Dev.	Maximum	Minimum	N
Toehold strategies	0.117	0.111	0.444	0.004	66
non-toehold strategies	0.124	0.126	0.541	0.005	66

Table 9: Hostile deal attitude and toehold biding in corporate takeovers

This table reports the results on the regression of hostile deal attitude on toehold bidding. In column 1 and 4, we perform OLS regressions. In column 2 and 5, IV regression using acquirer equity investment as the instrument for toeholds is performed. In column 3 and 6, OLS regression is performed in a matched sample consist of 66 deals of toehold strategies and 66 deals of non-toehold strategies based on propensity score matching. For each variable, we report the coefficient and standard error (in parentheses). *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Dependent variable:	HOSTILE					
	[TOEHOLD = TOEHOLD_DUMMY]			[TOEHOLD = TOEHOLD_SIZE]		
	Full sample	Full sample	Matched sample	Full sample	Full sample	Matched sample
	(1)	(2)	(3)	(4)	(5)	(6)
TOEHOLD	0.815***		-0.009	0.317		-0.590***
	(0.234)		(0.076)	(0.849)		(0.197)
TOEHOLD(IV)		-0.445			-0.357	
		(2.382)			(9.494)	
TARGET_SIZE	0.344***	0.337***	0.090**	0.333***	0.334***	0.099**
	(0.076)	(0.083)	(0.041)	(0.075)	(0.075)	(0.042)
TARGET_RUNUP	0.152	0.125	0.264	0.085	0.081	0.184
	(0.341)	(0.347)	(0.183)	(0.341)	(0.353)	(0.179)
TARGET_TURNOVER	4.624	4.204	3.217	6.548	6.427	1.068
	(11.003)	(10.690)	(4.730)	(11.461)	(11.374)	(4.872)
TARGET_NYSE|AMEX	-0.092	-0.101	-0.057	-0.124	-0.125	-0.076
	(0.138)	(0.134)	(0.086)	(0.137)	(0.137)	(0.087)
ACQUIRER_SIZE	-0.239***	-0.241***	-0.041	-0.240***	-0.241***	-0.047
	(0.059)	(0.060)	(0.039)	(0.059)	(0.059)	(0.041)
ACQUIRER_TURNOVER	-40.830**	-40.853**	-14.038	-47.759***	-47.821***	-11.181
	(16.285)	(15.942)	(10.517)	(16.705)	(16.707)	(10.346)
ACQUIRER_NYSE|AMEX	0.320*	0.344**	0.007	0.376**	0.380**	0.047
	(0.173)	(0.170)	(0.110)	(0.171)	(0.176)	(0.114)
HORIZONTAL	-0.090	-0.089	-0.056	-0.097	-0.097	-0.054
	(0.146)	(0.142)	(0.082)	(0.143)	(0.143)	(0.079)
POISON_PILL	1.891***	2.039***	0.595***	1.994***	1.995***	0.603***
	(0.315)	(0.357)	(0.165)	(0.303)	(0.303)	(0.169)

TENDER_OFFER	0.810***	0.871***	0.196**	0.870***	0.874***	0.161*
	(0.171)	(0.182)	(0.082)	(0.167)	(0.179)	(0.083)
ALL_CASH	0.158	0.162	-0.037	0.168	0.171	-0.031
	(0.163)	(0.160)	(0.088)	(0.160)	(0.159)	(0.087)
CONSTANT	-2.982***	-2.743***	-0.448	-2.756***	-2.743***	-0.414
	(0.689)	(0.931)	(0.338)	(0.680)	(0.719)	(0.339)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
Method	OLS	IV	PSM	OLS	IV	PSM
N	1,624	1,624	132	1,624	1,624	132

Table 10: Non-threshold toehold bidding and acquirer returns

This table reports estimates in regressions of acquirer returns on suboptimal toehold bidding. TOEHOLD-THRESHOLD measures the difference between observed toehold size and toehold threshold defined in Betton et al. (2009) in takeovers with positive toeholds. Column 1 and 3 report results with the full sample. Column 2 and 4 report regression results for takeovers involving toehold strategies. For each variable, both the coefficient and standard error (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Dependent variable:	ACQUIRER_CAR[-41, 1]		ACQUIRER_CAR[-41, END]	
	Full sample	Toehold strategies	Full sample	Toehold strategies
	(1)	(2)	(3)	(4)
TOEHOLD-THRESHOLD	0.292	0.530**	1.260	1.299
	(0.253)	(0.261)	(0.836)	(1.088)
(TOEHOLD - THRESHOLD)^2	-0.765	-0.919*	-3.267*	-2.077
	(0.583)	(0.538)	(1.839)	(2.127)
Control variables	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes
Method	OLS	OLS	OLS	OLS
N	1,550	63	1,550	63
R-squared	0.117	0.433	0.081	0.408

Table 11: Impact of previous toehold bidding on the toehold size in an expanded toehold sample.

This table reports estimates on toeholds in an expanded toehold sample. To collect more observations, we expand the sample by including non-public U.S. acquirers and dropping data requirement from CRSP and Compustat. The expanded toehold sample contains all the toehold strategies with available information between 1990 and 2014. LAGGED(TOEHOLD-THRESHOLD) refers to the difference between actual toehold size and toehold threshold in the last toehold bidding. For each variable, both the coefficient and standard error (in parentheses) are reported. *, **, and, *** denote significance levels of 10%, 5%, and 1%, respectively.

Dependent variable:	TOEHOLD_SIZE	TOEHOLD-THRESHOLD	HOSTILE
	(1)	(2)	(3)
THRESHOLD	0.147**		
	(0.063)		
LAGGED(TOEHOLD-THRESHOLD)		-0.289**	
		(0.122)	
TOEHOLD-THRESHOLD			-0.133*
			(0.077)
PUBLIC_ACQUIRER	-1.409	-0.029	0.029
	(1.472)	(0.092)	(0.029)
TARGET_NYSE|AMEX	-1.792	-0.006	0.040
	(1.537)	(0.056)	(0.031)
Deal characteristics	yes	yes	yes
Industry dummy	yes	yes	yes
Year dummy	yes	yes	yes
Method	OLS	OLS	OLS
N	568	123	568
R-squared	0.252	0.662	0.232